

XI. *On Certain Forms of the Genus Acraea. A reply to M. Ch. Oberthür.* By H. ELTRINGHAM, M.A., D.Sc., F.Z.S.

[Read June 7th, 1916.]

PLATE LXXIV.

IN M. Charles Oberthür's *Études de Lépidoptérologie Comparée*, Fasc. xi, 1916, appears a study of Madagascan Lepidoptera, largely dealing with species of the genus *Acraea*. M. Oberthür states that after reading with great pleasure my monograph of the African species of the genus *Acraea* he has been moved to endeavour to complete some of the details and dispute some of my conclusions.

I would say at the outset that any criticism of my work is welcomed by no one more than by myself. M. Oberthür (p. 133, l.c.) says, "Un même sentiment nous anime, M. le Professeur Houlbert et moi même; la recherche de la vérité." All true scientific workers are animated by this sentiment, and if I feel it necessary to criticise to some extent Professor Houlbert's conclusions, he will, I am sure, consider my remarks in the same friendly spirit in which they are made, and as our countries are allied in the suppression of a barbarous race, so, in a more peaceful sphere, our scientists are allied in the search after truth.

First, then, as to the structure of the male armature in *Acraea*, Professor Houlbert suggests that in this genus occur the most complicated organs to be found in the Lepidoptera. The point is not of great importance, but I would ask him to examine, merely as a relaxation, the armatures of, say, *Hypolimnna monteironis*, some of the *Lycaenidae*, and Plate I in "The Genitalia of the *Noctuidae*" (F. N. Pierce, Liverpool, 1909).

Professor Houlbert next questions my contention that Mabille's effort to classify the genus *Acraea* on the structure of the armature is of little value. I stated at the time that Mabille's view seemed "based on an inadequate study of these structures." I see no reason to modify that statement now, and would only add that had Professor Houlbert

made some five hundred carefully mounted preparations of *Acraea* genitalia, as I had to do for my monograph of the genus, he would, I am sure, agree entirely with my statement.

At this point Professor Houlbert makes a curious error in quoting my words. In referring to Schatz and Röber's efforts to classify the species of *Acraea*, I stated that the "characters given are for the most part inconstant." These words Professor Houlbert makes to be my criticism of Mabille instead of Schatz and Röber. It is true I said almost the same thing of Mabille's characters. The words are: "the impossibility of these groups is evident from the instability of the characters suggested." My meaning here was, however, slightly different. Mabille named one of his groups *Aphanopeltis*, and his characteristic for this group was that the ventral plate of the male armature was a structure of variable form. It did not seem to me that variability, or as I said, instability, could be regarded as a suitable characteristic on which to found a subgenus. Moreover, the features Mabille selected for his classification are not features of a comparable kind, since in some species they do not occur at all. Finally, his attempt suffers from the great objection that it utilises a purely sexual characteristic as a feature on which to base a classification.

Now, whether applying to Mabille or to Schatz and Röber, Professor Houlbert objects to my words "the characters given are for the most part inconstant," and says, "mais, ou trouve-t-on des caractères constants?" Naturally I agree with him that characters are not constant in the absolute sense of the word. Were they so the whole majestic scheme of evolution would be an impossibility. Nevertheless, there are characters which are relatively sufficiently constant to enable us to use them as a basis for classification, and when I spoke of the inconstancy of Schatz and Röber's characters I indicated that they were devoid even of that relative constancy which was necessary if they were to be of any taxonomic value. I have nothing but admiration for the descriptions and excellent drawings of the armatures of *A. igati* and *A. damii*. As a study in the anatomy of these insects they are admirable. In a footnote on p. 145 Professor Houlbert says, "Mr. H. Eltringham, l.c. p. 7, a donné de ces organes, deux petites schémas trop simplifiés (fig. 11 et 12) qui ne peuvent fournir

qu'une idée très imparfaite de l'armature génitale des *Acraea*." I agree entirely that my "two little diagrams" "can only furnish a very imperfect idea of the genital armature in *Acraea*." They were not made with any such comprehensive purpose in view, but merely to illustrate the most essential differences between the two species *igati* and *damii*. My monograph runs to some 375 pages and over 250 illustrations. To have dealt with the detailed structure of the armatures of the 140 species of *Acraea* would have required another volume of similar dimensions, and would scarcely have served an advantageous purpose.

The second part of Professor Houlbert's interesting contribution deals with the sphragis, or seal, found on the female of most species of *Acraea* after pairing. That this structure is of great interest, and its function somewhat obscure, I certainly agree, but I cannot think that Professor Houlbert has thrown much light on the subject by declaring, as he does, that the sphragis is not the result of a secretion deposited by the male on the abdomen of the female. It is true that the process of formation has not, so far as I am aware, been actually observed in the case of an *Acraea*. A homologous formation occurs, however, in at least seven other genera of butterflies, and in the case of *Parnassius* the process of formation has been investigated by Mr. Arthur Thomson, and the subject is dealt with at some length by Mr. H. J. Elwes in his paper on *Parnassius* in Proc. Zool. Soc. Lond., p. 6 *et seq.*, 1886. In my monograph I referred to this article, but did not give extracts from it, thinking that the investigations mentioned were sufficiently well known. I would refer Professor Houlbert, and others who may be interested, to this paper. He will there see that the "pouch" is produced during copulation, and that there is exuded from the abdomen of the male a gelatinous substance which hardens rapidly on exposure to the air, and retains in its hardened condition impressions made upon it whilst in the viscous state. The sphragis in *Acraea* being a formation homologous with that in *Parnassius*, there is every reason to suppose that its origin is of the same nature. On p. 8 of my monograph I pointed out that Marshall had observed no less than three female *Acraeas* in which the sphragis had been duplicated, though both formations were more or less distorted in shape, "indicating that the second pairing must have

taken place immediately after the first, and whilst the first secretion was in a more or less viscous condition." That it is only produced by pairing is certain, since bred females, of which we have hundreds of examples at Oxford, *never* show the structure in question. In face of this fact it is difficult to understand why Professor Houlbert should have written, "Quant à l'origine même du sphragis nous n'avons pas en ce moment, de données assez précises; mais nous ne désespérons pas de l'expliquer le jour où il nous sera permis de suivre l'évolution de quelques *Acraea* vivants. Dans tous les cas, nous ne pouvons pas accepter l'opinion des auteurs qui considèrent le sphragis comme le résultat d'une sécrétion déposée par le mâle sur l'abdomen de la femelle au moment de l'accouplement."

Professor Houlbert expresses the opinion that the sphragis, owing to its perfect adaptation to the shape of the male armature, ensures the precise and unerring action of those complicated organs. It seems not to have occurred to him that the exact correspondence in shape between the sphragis and the male armature is due to the same cause which governs the correspondence between the plaster cast and its mould: the one has taken its shape through intimate contact with the other.

Two further points remain. Professor Houlbert on p. 152 expresses the opinion that the sphragis is an organ of adaptation, and that after pairing it falls off, and the female genital plate being thus uncovered, the eggs can be deposited, without hindrance, on the plants which are to sustain the larvae.

Now, in the first place, the sphragis does not fall off under normal conditions. It is found on the parent *Acraeas* in the Hope collections at Oxford, from which were bred long series of examples. Secondly, there is no necessity for its removal, since the external opening of the oviduct is not the same as the copulatory opening, but occupies a posterior position. The insect would be in no way inconvenienced in the matter if the copulatory orifice were hermetically sealed for the rest of its life after pairing. This fact of butterfly anatomy has doubtless escaped Professor Houlbert's notice. The remaining point with which I must deal is the statement on p. 158 that the uncus of the male is more highly developed in those species whose females are found to bear a sphragis, and is very small in cases where the genital plate is reduced or absent. In very

many of the smaller *Acraeas* the sphragis is not or scarcely at all developed, yet in these the uncus is, in proportion to the claspers, very large and well developed.

In one or two places Professor Houlbert suggests that he has had some difficulty in making out the structure of the genital armatures owing to their desiccated condition. Should he continue his investigations, and I sincerely hope he will do so, he will find that if the terminal segments of the abdomen are boiled in caustic potash (KHO) for a minute or two all extraneous matter is easily removed, and the specimen can be dehydrated, cleared in clove oil, and mounted in Canada balsam in a cell so that it is not compressed. He will then find that the organ can be examined under the most favourable conditions, and its form easily made out with the help of the stereoscopic microscope.

If he will submit a sphragis to the same treatment he will find that it disintegrates and dissolves with great rapidity, conclusive evidence that it is of an entirely different chemical constitution from that of the organs to which he would seek to ally it.

Following on this discussion of the armature and sphragis generally, M. Oberthür contributes interesting details concerning some of the less-known Madagascar *Acraeas*. He points out an error in my account of *Acraea igati*, which I stated to occur only in Madagascar, whereas he has examples from Anjouan and Grand Comoro. I was, of course, unaware of this when my paper was published. *A. damii* and *A. fornax* are dealt with, and finally the author gives a comparative study of *A. strattipocles*, *A. masamba*, and a form to which he gives specific rank, *A. siliana*. M. Oberthür's discussion of these forms is a most useful addition to our knowledge. With characteristic generosity the eminent French naturalist has presented to the Hope Collection at Oxford beautiful series of several Madagascar species of *Acraea*. Amongst these are a number of examples labelled *masamba* and some labelled *silia*. M. Oberthür now finds that the latter do not in reality correspond to Mabille's var. *silia*, but are in fact an undescribed form which he regards as a good species, and for which he proposes the name *siliana*. Furthermore, he declares his inability to distinguish the species of *Acraea* to which Mabille's Pl. 9, fig. 1, 1a (*masamba*) and fig. 3 (var. *silia*) belong. *A. strattipocles* is dealt with in the same section of the paper, but as there is no difficulty in identifying

this as a good species, it remains only to deal with *masamba* and *siliana*.

M. Oberthür expresses his regret at having sent specimens labelled as *silia*, which do not precisely agree with Mabille's *silia*, and which he now refers to his new species *siliana*. Professor Houlbert has examined the male and female genitalia and also some of the wing scales, and the specific rank of *siliana* is claimed on the following points.

	<i>masamba</i>	<i>siliana</i>
H.-w. border upper-side	regular outline	indented at 4th nervure.
F.-w. inner margin	suffused with black	not so.
Papilla on which occurs external orifice of bursa copulatrix	rounded	triangular.
Uncus of male	straight	curved.
Scales from f.-w. apical area	suboval	subtriangular.
Ditto from internal angle	rounded	subangulate.

Now, in dealing with these points I should explain that in discussing the forms in my monograph, the supposed examples of *silia* which I had before me were specimens of what M. Oberthür now calls *siliana*, and furthermore amongst those labelled *masamba* were four examples of the *siliana* form, but of the dark ground-colour similar to that in *masamba*, a variety named by M. Oberthür *A. siliana antakara*. It was on these examples that, in speaking of the indentation of the hind-wing border, I based my remark that "the same feature is observable in varying degrees of development in a series of *masamba*."* Having removed these examples, I must admit that the indentation of the border is peculiar to the *siliana* form. Moreover, the black suffusion of the inner margin of the fore-wing in *masamba*, especially in the male, seems a good character. As to the papilla related to the orifice of the *bursa copulatrix* in the respective females, I regret I have not been able to make out this character, alluded to by Professor Houlbert,

* This remark of mine is curiously misquoted on p. 170, the word "observable" being printed "*inobservable*" and emphasised by small capitals.

though it may well be as he states. Greater differences than this occur in the genital plates of forms of *A. acrita*, but do not enable us to define specific limits to those forms. The alleged difference in the uncus in the two species does not appear to me to be valid. The organ in both species is curved in a vertical plane. If Professor Houlbert alludes, as I think he does, to a curve in the horizontal plane, such an appearance in a dry specimen is of no value whatever, since the organ is frequently distorted through desiccation. In the many dissections I have made, I have never found the uncus in any *Acraea* to be curved laterally when once its flexibility has been restored by the caustic treatment. Such a curved condition would be a form of asymmetry, a phenomenon which, so far as my experience goes, does not occur in any species in the male, though one or two females have an asymmetrically placed copulatory orifice (*neobule*, etc.). In my opinion, the male armatures of *masamba* and *siliana* are not distinguishable when the features of these organs are considered as a whole and in relation to those of other species of the genus. In some genera the male armatures are practically indistinguishable, and so useless for specific distinction, but the genus *Acraea* is remarkable for the constant intra-specific differences in the genitalia.

Now as to the scales. On Plate LXXIV I have illustrated sixteen examples of scales in an endeavour to confirm Professor Houlbert's conclusions. Figs. 1-5 are taken from the fore-wing apical area of *A. masamba*, and figs. 6-10 from the same area in *A. siliana*. No two are exactly alike, nor do any quite resemble Professor Houlbert's figures on p. 169 of the paper referred to. In spite of diligent search I could find no scales which had not the deeply indented "shoulder" at the base, shown in my drawings, but quite absent in those of Professor Houlbert. Figs. 11-13 are from the fore-wing internal angle of *masamba*, and figs. 14-16 from the same area in *siliana*. So far as I can judge, the outlines of the scales are so variable that they do not furnish a character which is useful in this case for specific distinction. Nor is the outline of scales an entirely satisfactory character for the purpose, since my friend Dr. F. A. Dixey has found that even the Pierine scent scales, so characteristic in most cases, show considerable variation in different individuals of *G. napi*.

Let us then sum up the whole matter : The most essential

and constant differences between the two forms are differences of pattern. The structural differences are very slight and open to question. In my monograph of the genus I stated that "with our present conception of the evolutionary nature of species formation the precise limitation of what is called a 'species' has necessarily lost much of its importance, as compared with the recognition of the degrees of affinity which appear to obtain between the forms studied. . . . In many cases it is extremely difficult, if not impossible, to decide whether a form has yet passed over that dividing line which separates one true species from another. The difficulty experienced is merely a confirmation of our theories of species formation." *A. siliana* does not appear to occur in precisely the same localities as *A. masamba*. The characteristics of *A. siliana* as compared with *A. masamba* are equivalent to those I should regard as applying to a subspecies, *i.e.* a geographical race not entirely and specifically separate. M. Oberthür prefers to regard the two forms as distinct species. After all, it is of little real importance which view we adopt. The case is similar to that of *A. welwitschii* and *A. anemosa*.

Finally, I should wish to express my appreciation of M. Oberthür's most valuable and interesting contribution to our knowledge of the *Acraeas*, of M. Culot's exquisite plates, and of Professor Houlbert's beautiful drawings. The structural features of the Lepidoptera have too long been obscured by the dazzling beauty of their wings, and we shall look forward with pleasurable anticipation to further valuable communications from so ideal a collaboration as that of M. Charles Oberthür and Professor Houlbert.

EXPLANATION OF PLATE LXXIV.

- FIGS. 1-5. Scales from f.-w. apical area of *A. masamba*.
 6-10. " " " " " *A. siliana*.
 11-13. " " " internal angle of *A. masamba*.
 14-16. " " " " " *A. siliana*.

DECEMBER 29, 1916.